1974

Virginia Commonwealth University School of the Arts Graduate Bulletin

Virginia Commonwealth University

VIRGINIA COMMONWEALTH UNIVERSITY BULLETIN

School of Arts and Sciences Graduate Issue 1974-75

The Board of Visitors, the administration, and the faculty of Virginia Commonwealth University are committed to a policy of equal opportunity in education without regard to race, creed, sex, or national origin.

VIRGINIA COMMONWEALTH UNIVERSITY BULLETIN

SCHOOL OF ARTS AND SCIENCES

GRADUATE ISSUE 1974-75

RICHMOND, VIRGINIA

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1974-1975 UNIVERSITY CALENDAR

AUGUST

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

2
Last day for non-summer school students to submit all required transcripts, etc., for admission to a degree program for fall semester

26
General faculty meeting at 10:30 a.m.

Faculty advisors' meeting at 2 p.m.

26-30
Orientation for all new degree seeking students

26-28
Orientation and registration, MCV Campus

27-28
Evening College registration

28-30
Advising and registration for continuing, re-admitted, and new degree-seeking day students.

29
Classes begin at 8 a.m., MCV Campus

30
Registration for non-degree-seeking day students

SEPTEMBER

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

2
Labor Day holiday

3
Classes begin at 8 a.m., Academic Campus

3-6
Add/drop and late registration for day students

6
Last day to submit a special day application

9
Last day to withdraw and receive 80 percent refund

16
Last day to withdraw and receive 60 percent refund

23
Last day to withdraw and receive 40 percent refund

27
Last day for special day students to submit required admission documents to receive credit for fall semester

30
Last day to withdraw and receive 20 percent refund

OCTOBER

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

1
Last day for degree candidates to file application for January degrees

12
Last day to drop a course with grade of "W"

14-19
Mid-semester evaluation

23
Mid-semester grades due in registrar's office by 9 a.m.

NOVEMBER

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

1
Advance registration —Evening College

4-15
Advising and registration for continuing degree-seeking day students for spring semester

16
Last day to drop a course with grade of "WF" or "WP"

27
Thanksgiving holiday begins at 1 p.m. for Academic Campus; at 5 p.m. for MCV Campus

29
Final date for oral defense of graduate theses for January completion of degrees

DECEMBER

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

2
Last day to submit an application for admission or re-admission to a degree program for spring semester

2
Thanksgiving holiday ends at 8 a.m.

11
Last day of classes, Academic Campus

12-21
Final examinations, Academic Campus

13
Last day of classes, MCV Campus

14
Last day of Evening College classes

16-20
Final examinations, MCV Campus

21
Christmas vacation begins at 12 Noon

27
All fall semester grades due in registrar's office by 9 a.m.

JANUARY

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

1
Last day to submit all required transcripts, etc., for admission to a degree program for spring semester

7
Placement testing for all new degree-seeking students

7-8
Evening College registration

8
Christmas vacation ends at 8 a.m.

8-9
Advising and registration for continuing, re-admitted, and new degree-seeking day students

10
Registration for day non-degree-seeking students

13
Classes begin at 8 a.m.

13-14
Add/drop and late registration for all day students

14
Last day to submit a special day application

17
Last day to withdraw and receive 80 percent refund

24
Last day to withdraw and receive 60 percent refund

31
Last day for spring degree candidates to file application for May graduation

Last day for special day students to submit required admission documents to receive credit for spring semester

Last day to withdraw and receive 40 percent refund

MARCH

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

7
Mid-semester grades due in registrar's office by 9 a.m.

Spring vacation begins at 5 p.m., MCV Campus

8
Spring vacation begins at 12 Noon, Academic Campus

17
Spring vacation ends at 8 a.m.

31 to Apr. 11
Advising and registration for continuing, degree-seeking day students for fall semester

APRIL

S	M	T	W	T	F	S
			1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

14
Begin summer advance registration

18
Last day to drop a course with grade of "WF" or "WP"

25
Final date for oral defense of graduate theses for May graduation

MAY

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

2
Last day of classes, MCV Campus

3
Last day of classes, Academic Campus

5-13
Final examinations

15
All spring semester grades due in registrar's office by 9 a.m.

17
Commencement

19
Pre-session begins

JUNE

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

4-5
Summer Sessions registration

6
End of pre-session

9
Six-week session and summer evening classes begin

JULY

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

18
Six-week session ends

Registration for post sessions

21 to Aug. 8
Three-week post session

21 to Aug. 22
Five-week post session

Aug. 6-7
Summer evening classes end

GENERAL INFORMATION

PURPOSES AND OBJECTIVES OF THE UNIVERSITY

Purposes:

Virginia Commonwealth University shall endeavor to provide an educational environment nurturing and stimulating teaching, research, and service. Sensitive to the needs of urban life in the Commonwealth, it will strive to promote the pursuit of knowledge and the dissemination of professional skills.

Objectives:

To identify and anticipate urban problems, to advance experimentation and open-ended attitudes in their solution through appropriate research, and to develop the university as a planning and resource center for urban living.

To commit itself to creative and varied programs of teaching, research, and consultation, contributing to the improvement of the quality of life within urban communities.

To promote and develop programs of continuing and graduate education relevant to contemporary society.

To provide an educational climate which will stimulate in the student a lifelong commitment to learning and service, which will develop competence and motivation to work toward the realization of individual and community potentials, and which will set for the student an example of excellence.

To develop and maintain an environment of educational excellence which will attract and motivate faculty to pursue their work in accordance with the highest educational standards.

To recognize the imaginative power of the arts and humanities in reflecting the problems and aspirations of society and of the human condition; to acknowledge the role of the arts in changing behavior; and to provide opportunities throughout the university and the Commonwealth to maximize their relevance, both individually in the self-realization of the student, and publicly, in exhibition and performance.

To complement existing institutions of higher learning by providing programs of a uniquely urban character, thus enhancing the educational opportunities of the Commonwealth.

HISTORY OF VIRGINIA COMMONWEALTH UNIVERSITY

Virginia Commonwealth University traces its founding back to 1838 when the Medical College of Virginia was established as the medical department of Hampden-Sydney College. This medical college, now the MCV Campus, was united with Richmond Professional Institute, now the Academic Campus, in 1968 to create the new university. The Academic Campus is located just west of Belvidere Street in Richmond's Fan District. The MCV Campus is located east of the downtown shopping area.

GRADUATE DEGREES

Graduate programs of study on the Academic Campus lead to the following degrees: master of arts, master of art education, master of business administration, master of education, master of fine arts, master of music, master of music education, master of science, master of social work, master of urban and regional planning, and doctor of philosophy.

ACCREDITATION

Virginia Commonwealth University is a member of and accredited by the Southern Association of Colleges and Schools, the general accrediting agency for colleges in this region.

LIBRARIES AND THEIR RESOURCES

The Virginia Commonwealth University Libraries consist of the James Branch Cabell Library on the West Campus and the Tompkins-McCaw Library on the MCV Campus. Each library serves its home campus and offers service on a university-wide basis as required. Both libraries are expanding space and services through major construction projects that will, when completed, provide a combined capacity of 1,200,000 volumes. The libraries are designated as a partial depository for United States government documents.

The James Branch Cabell Library, a general university library, has a strong orientation toward undergraduate requirements with developing collections in certain graduate fields. The collection includes many book and journal titles on microform. The University Curriculum Laboratory, located within the library, circulates children's literature, textbooks, and teachers' guides. The Tompkins-McCaw Library's collection strongly emphasizes the health

sciences. Complete sets of all major indexes in these fields are part of the reference collection. Trained search analysts are available to help patrons obtain computer-produced bibliographies on specific biomedical and health-related topics.

GRADUATE FEES

Instructional Fees for the Academic Year*

Full-time Graduate Students:

Virginia residents, per year	$600
Non-residents, per year	880

Part-time Graduate Students:

Virginia residents	$34 per credit hour**
Non-residents	$50 per credit hour**

The tuition shown is for the academic year 1974-75. Educational costs are subject to similar price adjustments found in the costs of other commodities; therefore, fees may be changed for the academic year 1975-76.

The law affecting residence in Virginia is as follows: "No person shall be entitled to the admission privileges, or the reduced tuition charges, or any other privileges accorded only to domiciliaries, residents or citizens of Virginia, in the state institutions of higher learning unless such person is and has been domiciled in Virginia for a period of at least one year prior to the commencement of the term, semester or quarter for which any such privilege or reduced tuition charge is sought, provided that the governing board of such institutions may set up additional requirements for admitting students." VCU has no additional requirements for Virginia residency.

OTHER FEES

Application Fee: All students shall pay an application fee of $10 upon application for admission. This fee is not refundable. The check should be made payable to Virginia Commonwealth University.

Late Registration Fee: Full- and part-time students who register after the official registration period will be charged a late registration fee of $10.

Diploma Fee: A diploma fee of $16 is charged each candidate for a graduate degree.

Graduate Student Activities Fee: $9 per semester.

REFUNDS

A full- or part-time day student who withdraws in good standing shall be entitled to a refund of a portion of his tuition, room, and board fees for the semester in which he is currently enrolled. All other fees are non-refundable.

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*Subject to change.
**This fee applies to all courses taken for graduate credit.

Request for Refund: A request for a refund shall be made in writing to the Dean of Student Services before said request can be considered. The following policy governs the refund of room, board, and tuition fees:

1. A student who fails to register or is denied permission to register will be entitled to a full refund of tuition, room, and board if paid in advance.

2. A student will be entitled to a refund of 80 percent of his room, board, and tuition fees upon withdrawal before the end of the first week of the term (seven consecutive calendar days beginning with first day of classes) and a decrease of 20 percent each week thereafter up to and including the fourth calendar week. NO AMOUNT WILL BE REFUNDED FOR WITHDRAWAL AFTER THE FOURTH CONSECUTIVE CALENDAR WEEK OF THE TERM.

3. A student will not be entitled to a refund of room fees if he voluntarily withdraws from the university residence halls but remains registered for any course or courses at the university unless clearance is granted through the Office of the Dean of Student Services.

The actual date of withdrawal will be certified by the Office of the University Registrar; and refund, when appropriate, will be computed based on that certified date.

DELINQUENT ACCOUNTS

The university will not issue a degree, transcript of grades, or grade reports to any student who has not paid all charges in full. Students whose accounts are not paid in full may not be admitted to final examinations at the end of semesters.

A waiver is placed on accounts that reflect a balance due of $5 or less and for unpaid accounts that are supported by a scholarship authorization on file in the Office of Student Accounts.

Dishonored Checks:

A student, parent, or guardian who presents a check for payment of tuition and fees to Virginia Commonwealth University, and has the check returned for any reason by the bank as an uncollected item, will have 10 calendar days from the date of notification by the Office of Student Accounts to clear the check. If not cleared within this period, the student will be automatically suspended and may not attend classes until he has been officially reinstated by the Business Office. A charge of $5 will be levied against the maker of all dishonored checks with the exception of those for tuition. A $10 fee will be levied against the maker of a dishonored check for tuition.

After two weeks from the date of suspension, a student suspended because of a dishonored check may not be reinstated for the semester. Applications for reinstatement are to be made at the Office of the University Registrar.

Payment of Fees:

A student who fails to meet payments when due will be automatically suspended and may not attend classes until he has been officially reinstated and has paid all accrued fees, plus a $10 late payment charge. After two weeks from the date of suspension, a student suspended for failure to meet payments when due may not be reinstated for the semester. Applications for reinstatement are to be made at the Office of the University Registrar.

INSTALLMENT PAYMENT OF FEES

The university does not offer a financial aid plan for direct payment of semester charges on an installment basis. For those parents who wish to pay college costs in installments, the university recommends application to the Tuition Plan, Inc. or your local bank. The plan makes money available only for those expenses for which a student is billed by the university.

A descriptive brochure on the plan may be secured from The Tuition Plan, Concord, New Hampshire 03301.

POLICIES AND PROCEDURES FOR GRADUATE STUDIES

a. The grading system uses A, B, C, D, and F, with numerical equivalents of 4.0, 3.0, 2.0, 1.0, and 0, respectively, and the special grades of "I" and "PR."

The grade of "Incomplete" ("I") presupposes that the student is doing passing work on the completed portion of the course, but is unable to meet all the requirements of the course by the end of the term. A grade of "Incomplete" should not be given without an understanding between the instructor and the student. The maximum time limit for the removal of an "Incomplete" is the end of the last day of classes of the next semester following the semester (or summer session) in which the "Incompete" is incurred. At the end of the succeeding semester, an unremoved grade of "Incomplete" automatically is changed to a grade of "F." Exceptions to this procedure must be approved by the school or department chairman upon the recommendation of the instructor prior to the time limit and a statement filed with the registrar.

The grade of "Progress" may be used only in thesis courses and other courses designated by the Committee on Instruction of the Academic Campus. "PR" is assigned as an interim grade for courses which are not completed at the time final grades are to be submitted. A grade of "PR" will not be included in the calculation of the grade point average (GPA). The grade of "PR" must be removed within the time limit set for the degree.

b. A graduate student is expected to maintain an overall grade point average of 3.0 ("B").

A student who does not maintain a 3.0 ("B") average may be dropped from his program at any time by the appropriate department or school committee. If a student earns less than a "B" on 20 percent or more of all attempted credits, his graduate status must be reviewed by the appropriate department committee.

c. A graduate student must have earned an overall grade point average of 3.0 ("B") to receive a degree.

d. Full-time graduate status shall consist of a minimum of nine and a maximum of 16 credits per semester. A maximum of 12 semester credits may be earned in summer sessions each summer.

e. A minimum of at least half of the credits required in the student's program shall be those designated as excusively for graduate students; that is, those at the 600 level or above.

f. Students must continually show acceptable professional behavior to be retained in a program of graduate studies.

g. All requirements for the master's degree must be completed within seven years from the date of admission to graduate study. This time limitation applies to both full- and part-time students. Some schools may limit the student to fewer years.

LIMITATION ON CATALOG PROVISIONS

All rules and regulations set forth in this bulletin, as well as the statements regarding fees, will apply until further notice. The right is reserved to make changes in course of study, in fees, and in rules and regulations governing the conduct of the work in all schools and programs, in the faculty and staff, and in the classification of students whenever university authorities deem it expedient or wise to do so.

SCHOOL OF ARTS AND SCIENCES

The School of Arts and Sciences offers the following graduate degree programs:

M.S. in biology, M.S. and Ph.D. in chemistry, M.S. in mathematics, M.S. and Ph.D. in psychology, and M.S. in sociology.

These programs are described in the sections which follow.

No graduate credit for any course work may be granted until the applicant has been admitted to a degree program. The possible applicability of credit for courses taken at Virginia Commonwealth University and/or elsewhere prior to this admission will be determined by the department in conjunction with the dean.

Persons applying for admission to any of the graduate programs listed above must:

1. Submit an application on forms secured from the Office of the Dean of the School of Arts and Sciences. The applicant should follow carefully all instructions on the forms.
2. Arrange to have an official transcript sent from each institution attended as an undergraduate and an official transcript of all work undertaken beyond the bachelor's degree. These transcripts must be sent directly to the dean, School of Arts and Sciences, from the institution attended and copies will not be accepted from the applicant.
3. Order Graduate Record Examination scores, including the advanced score in the area of specialty, to be sent directly to the dean, School of Arts and Sciences, from the Educational Testing Service.
4. Submit a letter to the dean, School of Arts and Sciences, stating the applicant's reason for desiring to undertake graduate study.

5. Arrange for three academic letters of recommendation (on forms furnished the applicant) to be sent directly to the dean, School of Arts and Sciences.

6. Include an application fee of $10.

All applications will be considered in terms of the specific requirements for admission noted in the description of the individual programs and of the applicant's ability to perform satisfactorily in the program for which he has applied. The judgment of that ability will be based on the supporting material submitted with the application. Final action on admission is taken by the dean of the School of Arts and Sciences, in consultation with the department concerned.

Applicants whose applications reach the university after August 1 for the fall semester and December 15 for the spring semester should not expect their applications to be processed in time for registration. The applicant whose application arrives late may be considered for admission as a specal student, but there is no guarantee that the special student will be accepted into a degree program.

DEPARTMENT OF BIOLOGY

The Department of Biology offers a program leading to a master of science degree. Areas of specialization are environmental biology, systematic biology, developmental biology, behavioral biology, cellular biology, molecular biology, and comparative physiology*.

Degree candidates are required to take a minimum of 32 semester hours of credit which must include: a minimum of two and a maximum of four credit hours in seminar, one to six credit hours in research and thesis, and a minimum of four lecture courses exclusive of problems courses. Problems courses may be used as electives but only nine credit hours may apply toward the degree requirement and only three credit hours of any one course number may be taken. A maximum of six graduate credit hours of work taken at other institutions may be transferred if they meet departmental approval. Each student will be required to pass a final examination which will cover course content and research.

In addition to the general requirements for admission to graduate programs in the School of Arts and Sciences, the following requirements of the Department of Biology represent the minimum acceptable standards for admission:

1. Thirty semester credits in undergraduate biology.

2. Two years of college chemistry, including organic chemistry.

3. One year of college mathematics.

4. One year of college physics.

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*Students interested in pursuing a master of science degree in human physiology should consult the Department of Physiology at the Medical College of Virginia Campus of Virginia Commonwealth University.

5. Three letters of recommendation pertaining to the student's potential ability as a graduate student in biology.

6. Graduate Record Examination scores, including those of the advanced biology examination.

Provisional admission may be granted when deficiencies exist. These deficiencies must be removed by the end of the first year of residence, at which time the student's application will be re-examined. Courses which are remedial or designed to remove deficiencies will not be accepted for credit toward the fulfillment of the course requirements for the master's degree.

Graduate Minor in Biology

A minimum of nine semester hours excluding seminar and limited to no more than one problems course (3 credits).

COURSE DESCRIPTIONS*

Biology 500 Ecology Semester course; 3 lectures and 3 laboratory hours. 4 credits. Prerequisite: 12 credits in biology. A study of the interaction of the organism and the biological and physical environments.

Bology 503 Biology of the Fishes Semester course; 2 lecture and 6 laboratory hours. 4 credits. Prerequisite: Biology 201 or permission of the instructor. Evolution, taxonomy, structure, behavior, and ecology of fishes. Laboratory work will include special field trips for the collection of specimens.

Biology 509 Plant Anatomy Semester course; 2 lecture and 6 laboratory hours. 4 credits. Prerequisite: Biology 208. Preparation and study of cells, tissues, and organs of seed plants.

Biology 510 Plant Taxonomy Semester course; 1 lecture and 5 laboratory hours. 3 credits. Prerequisite: Biology 101, 102, or permission of instructor. Systematic survey of the vascular plant families with emphasis on relationships. Some field trips for observing local flora.

Biology 512 Radiation Biology Semester course; 3 lecture hours. 3 credits. Prerequisites: 16 credits in science, including eight credits in biology and/or the permission of the instructor. A presentation by a series of lectures and demonstrations of the fundamentals of radioactivity, including the properties of radiation and the application of radioisotopes and tracer methodology to the biological sciences and nuclear medicine. Included are the biological effects of ionizing radiation on living systems and the theoretical and practical aspects of radiation protection.

Biology 513 Parasitology Semester course; 3 lecture and 3 laboratory hours. 4 credits. Prerequisites: 14 credits in biology or permission of the

*Continuous courses may only be taken in the sequence listed; semester courses may be taken in any sequence; year courses do not carry partial credit for one semester's work without the other.

instructor. A survey of the life cycles, classification, host-parasite relationships, and general biology of animal parasites.

Biology 514 Aquatic Ecology Semester course; 2 lecture and 6 laboratory hours. 4 credits. Prerequisites: 12 credits in biology or permission of the instructor. An ecological approach to the physical, chemical, and biological study of fresh-water environments with particular consideration given to the methods and principles of evaluating water quality.

Biology 516 Ornithology Semester course; 3 lecture and 3 laboratory hours. 4 credits. Prerequisites: Biology 101, 102, or permission of the instructor. Basic biology of birds, with emphasis on their role in the environment.

Biology 517 Mammalogy Semester course; 2 lecture and 3 laboratory hours. 4 credits. Prerequisites: Biology 101, 102, and permission of the instructor. Study of the characteristics, adaptive radiation, and distribution of mammals, with emphasis on North American forms.

Biology 518 Plant Ecology Semester course; 3 lecture and 2 laboratory hours, two three-day field trips required. 4 credits. Prerequisites: Biology 400 or permission of the instructor. A lecture, field, and laboratory course concerned with the development, succession, and dynamics of plant communities and their interrelations with climate, soil, biotic, and historic factors.

Biology 520 Plant Physiology Semester course; 3 lecture and 3 laboratory hours. 4 credits. Prerequisites: Biology 207 or 208 and Chemistry 301-302. Cell structure and functions; water relations; inorganic plant nutrition; metabolism; plant growth regulators.

Biology 522 Evolution and Speciation Semester course; 3 lecture hours. 3 credits. Prerequisite: Biology 310 or equivalent. Study of evolutionary principles, with emphasis on genetic and environmental factors leading to changes in large and small populations of plants and animals, and the mechanisms responsible for speciation.

Biology 529 Neuroanatomy Semester course; 2 lecture and 2 laboratory hours. 3 credits. Prerequisite: Biology 305 or permission of the instructor. A study of the morphology and functional aspects of the central and peripheral nervous systems of the human body.

Biology 535 Herpetology Semester course; 2 lecture hours, 2 credits. Prerequisite: Biology 201 or permission of the instructor. A study of the phylogeny, natural history, and adaptation of the amphibians and reptiles.

Biology 536 Laboratory in Herpetology Semester course; 1 credit. Prerequisites: Biology 201 and permission of the instructor. Exercises on the anatomy, classification, and behavior of amphibians and reptiles. Two weekend field trips required.

Biology 540 Quaternary Paleoecology Semester course; 3 lecture hours. 3 credits. Pre- or corequisite: an upper-level course in ecology. A survey of Quaternary geology, climates, environments, and biotas. Ecological

processes are studied within a temporal framework of the last two million years. Emphasis is placed on methods available for investigating and reconstructing Quaternary environments.

Biology 562 Comparative Morphology of Vascular Plants Semester course; 3 lecture and 3 laboratory hours. 4 credits. Prerequisite: six credits in botany or permission of the instructor. A study of the relationships between the various taxa of the Tracheophytes, based upon examination and comparison of organ development.

Biology 565 Functional Human Anatomy Semester course; 3 lecture and 3 laboratory hours. 4 credits. Prerequisite: Biology 205 or equivalent. A study of the anatomy and kinesiology of the human body using prosected specimens and the dissected cadaver. Particular emphasis is placed upon the study of the extremities. Not applicable to the major in biology; intended primarily for students in the Department of Occupational Therapy.

Biology 570, 571 Selected Topics in Botany Semester courses; 3 lecture hours. 3, 3 credits. Prerequisites: Biology 207 and 208 or permission of the instructor. Selected topics and in-depth study in a specific area of botany.

Biology 582 Marine Biology Semester course; 3 lecture and 3 laboratory hours. 4 credits. Prerequisite: Biology 414/514 or permission of the instructor. A lecture, field, and laboratory course concerned with the working principles of biological oceanography and estuarine ecology. A study of selected marine faunal and floral communities and their interactions, particularly as they influence man and the environment.

Biology 600 Research and Thesis Semester course. Credits and hours to be arranged. Independent research by students in areas of systematics, environmental, developmental, behavioral, cellular, molecular biology, and comparative physiology.

Biology 601 Seminar Semester course; 1 credit. Independent reading and study in selected areas of biology leading to an oral presentation by students. May be repeated for credit.

Biology 609, 610 Problems in Biology Semester courses. Credit and hours to be arranged. A course designed to provide an opportunity for independent research in any area of biology outside the graduate student thesis area.

Biology 611, 612 Topics in Systematics Semester courses. 3, 3 credits. Studies of particular areas in systematic biology. Concurrent sections may be offered.

Biology 613, 614 Topics in Environmental Biology Semester courses. 3, 3 credits. Studies of particular areas in environmental biology. Concurrent sections may be offered.

Biology 615, 616 Topics in Developmental and Behavioral Biology Semester courses. 3, 3 credits. Studies of particular areas in developmental and behavioral biology. Concurrent sections may be offered.

Biology 617, 618 Topics in Physiology Semester courses. 3, 3 credits. Studies of particular areas in physiology. Concurrent sections may be offered.

Biology 624 Plant Systematics Semester course; 3 lecture hours. 3 credits. Prerequisite: Biology 510 or a course in plant taxonomy. A lecture course in plant systematics. A study of experimental methods for solving taxonomic and systematic problems in the vascular plants.

Biology 626 Physiological Ecology Semester course; 3 lecture and 4 laboratory hours. 4 credits. Prerequisites: Biology 400 or 414 or equivalent. Studies of the physiological adjustments and adaptations made by organisms in response to their environment.

Biology 680 Algal Ecology Semester course; 2 lecture and 6 laboratory hours. 4 credits. Prerequisite: Biology 414/514 or permission of instructor. An ecological approach to the study of freshwater and marine algae. The identification, morphology, life cycles, and culture of major algae divisions. Review of recent literature and discussion of selected topics in algae ecology.

Additional courses offered on the MCV Campus which supplement our graduate courses are listed below. The School of Basic Sciences and Graduate Studies section of the MCV Campus Bulletin should be consulted for other courses that are available to graduate students.

Anatomy
- 514 Techniques in Electron Microscopy

Biochemistry
- 503 General Biochemistry
- 604 Enzymology
- 606 Control of Metabolic Processes

Biometry
- 543 Statistical Methods

Biophysics
- 502 Applied Electronics in Biology and Medicine
- 602 Molecular Biology

Human Genetics
- 504 Biochemical Genetics (506 Lab)
- 511 Cytogenetics (513 Lab)

Microbiology
- 505 Immunobiology

Physiology
- 504 General Physiology (same as Microbiology 504)
- 551 Advanced Mammalian Physiology I (553 Lab)
- 552 Advanced Mammalian Physiology II (554 Lab)

DEPARTMENT OF CHEMISTRY

The Department of Chemistry offers programs leading to the degrees of master of science and doctor of philosophy. The programs provide oppor-

tunities for concentrated study in either analytical, inorganic, organic, or physical chemistry. A plan of study is worked out individually for each student to insure a sound basis for research. In keeping with the university's commitment as an urban institution, the department also offers part-time programs leading to these degrees.

For admission, a student is expected to have a bachelor's degree from an accredited college or university with 30 semester credits in chemistry. Admission on a special basis is possible for a student temporarily lacking this expected chemistry background. Acceptance is based upon undergraduate performance, satisfactory scores on the Graduate Record Examinations, and letters of recommendation.

Graduate students in the Department of Chemistry may receive financial support via teaching assistantships or research assistantships or fellowships. Admission forms for graduate study and applications for fellowships and assistantships are available on request by writing to the Dean, School of Arts and Sciences, Virginia Commonwealth University, 901 West Franklin Street, Richmond, Virginia 23284.

Degree Requirements

Entering graduate students are required to take proficiency examinations in analytical, inorganic, organic, and physical chemistry. These examinations are at the level of sound undergraduate courses and are offered in early fall and spring. These are used to evaluate the student's strengths and weaknesses and his program is planned accordingly.

Students studying for the M.S. degree must demonstrate competency in analytical, inorganic, organic, and physical chemistry. New students who do well on the proficiency examinations may by decision of the chemistry faculty be considered to have demonstrated the necessary competency. The M.S. student is expected to earn a minimum of 18 semester hour credits in graduate courses in chemistry and 12 semester hour credits in research. The courses submitted for the M.S. degree should normally include the core courses:

Chemistry 504. Advanced Organic Chemistry
Chemistry 510. Atomic and Molecular Structure
Chemistry 532. Advanced Analytical Chemistry
Chemistry 615. Chemical Thermodynamics
Chemistry 620. Advanced Inorganic Chemistry

or their equivalents. Additional graduate courses to be taken will be determined in consultation with the faculty research advisor and the faculty of the Department of Chemistry. Students are expected to participate in the department's seminar program for a minimum of two semesters and present at least two formal talks in the seminar program. An acceptable research thesis and a final oral examination on the thesis are required. Full-time students should complete these degree requirements in two years.

Students seeking the Ph.D. degree must demonstrate competency in analytical, inorganic, organic, and physical chemistry. The students who do ex-

ceptionally well in the proficiency examinations may by decision of the chemistry faculty be considered to have demonstrated the necessary competency. The proficiency examinations may be repeated.

Students studying for the Ph.D. degree are expected to earn a minimum of 30 semester hour credits in graduate courses in chemistry. The core courses listed above are considered a part of the required 30 hours. Other graduate courses to be taken will be determined in consultation with the faculty research advisor and the faculty of the Department of Chemistry. Students are expected to participate in the department's seminar program for a minimum of three semesters and present at least three formal talks in the seminar program. A reading knowledge of an approved foreign language is also required.

The student is required to complete a written and oral comprehensive examination in his major field to become a Ph.D. candidate. The oral comprehensive examination includes the defense of an original research proposal on a topic unrelated to the doctorate dissertation research. The student must conduct a substantial original investigation under the supervision of his advisor and prepare a dissertation reporting the results of the research and analyzing its significance in relation to existing scientific knowledge. An oral defense of the dissertation will be held. Full-time students should complete the degree requirements in about four years.

Additional information and a more detailed description of the graduate program may be obtained from the Department of Chemistry.

COURSE DESCRIPTIONS*

Chemistry 504 Advanced Organic Chemistry I Semester course; 3 lecture hours. 3 credits. An integrated study of certain free radical and ionic reaction mechanisms with emphasis on electronic effects and stereochemical consequences of these reactions. Classical vs. nonclassical carbonium ions and the Hammett equation are discussed.

Chemistry 510 Atomic and Molecular Structure Semester course; 3 lecture hours. 3 credits. Qualitative and quantum mechanical treatment of atoms and molecules. Approximate and semiempirical calculations as well as experimental methods for the determination of molecular structure are discussed.

Chemistry 532 Advanced Analytical Chemistry Semester course; 3 lecture hours. 3 credits. Theories and principles involved in analytical techniques such as spectrometry, electrochemical analysis, titrations in nonaqueous solvents, and chromatography.

Chemistry 604 Advanced Organic Chemistry II Semester course; 3 lecture hours. 3 credits. An integrated study of the mechanism and stereochemistry of organic reactions and their application to organic synthesis. Emphasis is placed on addition and condensation reactions, carbanions, carbenes, and other reactive intermediates.

*Continuous courses may only be taken in the sequence listed; semester courses may be taken in any sequence; year courses do not carry partial credit for one semester's work without the other.

Chemistry 605 Physical Organic Chemistry Semester course; 3 lecture hours. 3 credits. The theory and application of physical methods in the study of the behavior of organic compounds. Topics covered include homogeneous kinetics, equilibria, acid-base catalysis, and the quantitative correlation of structure and reactivity as they apply to the understanding of the mechanisms of organic reactions.

Chemistry 606 Methods of Structural Determination in Organic Chemistry Semester course; 3 lecture hours; 3 credits. Lecture and laboratory problems illustrating the application of instrumental analytical techniques for the solving of organic structural problems.

Chemistry 610 Applied Quantum Chemistry Semester course; 3 hours; prerequisite Chemistry 410 or 510 (Atomic and Molecular Structure); Quantum mechanics applied to chemical problems in UV, IR and NMR spectroscopy and the electronic structures of atoms and molecules; development of the selfconsistent field equations.

Chemistry 615 Chemical Thermodynamics Semester course; 3 lecture hours. 3 credits. The study of the laws of thermodynamics and their application to pure phases, solutions, and changes in state.

Chemistry 616 Chemical Kinetics. Semester course; 3 lecture hours. 3 credits. A study of the rates and mechanisms of chemical reactions, reaction rate theory, kinetic theory of gases, and theories of catalysis.

Chemistry 620 Advanced Inorganic Chemistry Semester course; 3 lecture hours. 3 credits. A study of the periodic properties of the elements with an emphasis on nuclear structure and reactions, inorganic nomenclature, atomic and molecular structure and bonding, reaction mechanisms, and a survey of the modern physical techniques of inorganic chemistry.

Chemistry 650 Special Topics Semester course; 1-4 credits. By arrangement with department chairman. Lectures, tutorial studies, and/or library assignments in selected areas of advanced study not available in other courses or as part of the research training. May be repeated for credit.

Chemistry 660 Chemistry Seminar Semester course; 1 credit. In addition to reports that are presented by students, staff, and visiting lecturers, current problems and developments in chemistry are discussed. May be repeated for credit.

Chemistry 690 Research Semester course; 1-12 credits. Research leading to the M.S. and Ph.D. degree. May be repeated for credit.

Additional courses offered on the MCV Campus which supplement our graduate courses are listed below. School of Basic Sciences and Graduate Studies section of the MCV Campus Bulletin should be consulted for other courses that are available to graduate students.

Pharmaceutical Chemistry

402 Organic Pharmaceutical Chemistry (Pharmacy)
503 Organic Pharmaceutical Chemistry (Pharmacy)
622 Stereochemistry
632 Heterocyclic Chemistry

Biochemistry
503 General Biochemistry

Biophysics
522 Circuit Design and Analysis
601 X-Ray Crystallography

DEPARTMENT OF MATHEMATICAL SCIENCES

The Department of Mathematical Sciences offers a program leading to a master of science degree with several possible areas of specialization.

The program offers maximum flexibility by allowing each student, in consultation with his graduate committee, to design a course of study which will best develop his competence in those areas most relevant to his scholarly and professional objectives. This program consists of a minimum of 30 semester credits, of which at least half must be at the 600 level. A thesis is required. Each student will be required to pass a written qualifying examination and an oral examination on his research. In addition to the general requirements for admission to graduate programs in the School of Arts and Sciences, the following requirements of the Department of Mathematical Sciences represent the minimum acceptable standards for admission:

1. Thirty semester credits in undergraduate mathematics, of which at least 18 semester credits must represent upper-level courses .
2. Three letters of recommendation pertaining to the student's potential ability as a graduate student in mathematics.
3. Graduate Record Examination scores, including those of the advanced mathematics examinations.

Provisional admission may be granted when deficiencies exist. These deficiencies must be removed by the end of the first year of residence, or its part-time equivalent, at which time the student's application will be reexamined. Courses which are remedial or designed to remove deficiencies will not be accepted for credit toward the fulfillment of the course requirements for the master's degree.

Program Leading to the Master of Science Degree in Mathematics

	Credits
Mathematical Sciences	18
(Including both semesters of a 600-level continuous course)	
Mathematical Sciences or Allied Field*	6-9
Thesis Credits*	3-6
Total (minimum)	30

*To be determined by the student's graduate committee.

COURSE DESCRIPTIONS*

Computer Science 501 Data Structures Semester course; 3 lecture hours. 3 credits. Prerequisites: Computer Science 202 and 301. Basic concepts of data. List structures, strings, and arrays. Representation of trees and graphs. Storage systems and methods of storage allocation and collection. Multilinked structures. Symbol tables, search techniques, and sorting techniques. Formal specification of data structures.

Computer Science 503 Programming Languages Semester course; 3 lecture hours. 3 credits. Prerequisites: Computer Science 202 and 301. Formal definition of programming languages including specification of syntax and semantics. Precedence, infix, prefix, and postfix notation. Global properties of algorithmic languages. Sub-routines, co-routines, and tasks. List processing, string manipulation, data description, and simulation languages. Run-time representation of program and data structures.

Computer Science 504 Compiler Construction Semester course; 3 lecture hours. 3 credits. Prerequisites: Computer Science 501 and 503. Review of program language structures, translation, loading, execution, and storage allocation. Compilation of simple expressions and statements. Organization of a compiler. Use of compiler writing languages and bootstrapping.

Computer Science 505 Computer Organization Semester course; 3 lecture hours. 2 laboratory hours. 4 credits. Prerequisites: Computer Science 202 and 301. Basic digital circuits. Boolean algebra and combinational logic, data representation and transfer, and digital arithmetic. Digital storage and accessing, control functions, input-output facilities, system organization, and reliability. Description and simulation techniques. Features needed for multiprogramming, multiprocessing, and realtime systems. Other advanced topics and alternate organizations.

Mathematics 503 Intermediate Probability Theory Semester course; 3 lecture hours. 3 credits. Prerequisites: Mathematics 202, 309. Fundamental concepts of the theory of probability. Random variables and probability distributions. Moments and moment generating functions. Functions of random variables, special probability distributions and their applications.

Mathematics 505 Modern Geometry Semester course; 3 lecture hours. 3 credits. Prerequisite: Mathematics 202. Corequisite: Mathematics 310. Topics in Euclidean, projective, and non-Euclidean geometries from a modern viewpoint.

Mathematics 507-508 Analysis I, II Continuous course; 3 lecture hours. 3-3 credits. Prerequisites: Mathematics 202, 211, 310; or consent of instructor. Theoretical aspects of calculus: sequences, limits, continuity, infinite series, series of functions, integration, differential geometry.

Mathematics 509-510 General Topology I, II Continuous course; 3 lecture hours. 3-3 credits. Prerequisite: Mathematics 211. Foundations and funda-

*Continuous courses may only be taken in the sequence listed; semester courses may be taken in any sequence; year courses do not carry partial credit for one semester's work without the other.

mental concepts of point-set topology. Topological spaces, convergence, connected sets, compactness, product spaces, quotient spaces, function spaces, separation properties, metrization theorems, mappings, compactification.

Mathematics 511 Applied Linear Algebra Semester course; 3 lecture hours. 3 credits. Prerequisites: Mathematics 301 and 310. The algebra of matrices, the theory of finite dimensional vector spaces, and the basic results concerning eigenvectors and eigenvalues, with particular attention to applications.

Mathematics 512 Applied Complex Analysis Semester course; 3 lecture hours. 3 credits. Prerequisite: Mathematics 507 or 517. The algebra and geometry of complex numbers, analytic functions, integration, series, contour integration, analytic continuation, conformal mapping, with particular attention to applications.

Mathematics 516 Numerical Analysis II Semester course; 3 lecture hours. 3 credits. Prerequisites: Mathematics 301 and 515. The solution of linear systems by direct and iterative methods, matrix inversion, the evaluation of determinants, and the calculation of eigenvalues and eigenvectors of matrices. Application to boundary value problems in ordinary differential equations. Introduction to the numerical solution of partial differential equations. Selected algorithms will be programmed for solution on computers.

Mathematics 517-518 Methods of Applied Mathematics Continuous course; 3-3 credits. Prerequisite: Mathematics 301. Vector analysis, matrices, complex analysis, special functions, Legendre and Hermite polynomials. Fourier series, Laplace transforms, integral equations, partial differential equations, boundary-value and initial-value problems.

Mathematics 520 Game Theory and Linear Programming Semester course; 3 lecture hours. 3 credits. Prerequisite: Mathematics 310. The mathematical basis of game theory and linear programming. Matrix games, linear inequalities and convexity, the minimax theorems in linear programming, computational methods, and applications.

Mathematics 601-602 Abstract Algebra I, II Continuous course; 3 lecture hours, 3-3 credits. Prerequisites: Mathematics 401 and 402. A study of algebraic structures (including groups, rings, and fields), Galois theory, homomorphisms, sub-algebras, direct products, direct decompositions, subdirect decompositions, free algebras, varieties of algebras.

Mathematics 603-604 Advanced Probability Theory Continuous course; 3 lecture hours. 3-3 credits. Prerequisites: Mathematics 508 and 503, or Statistics 513, or Biometry 545. A measure-theoretic approach to the theory of probability. Borel sets, probability measures, and random variables. Special topics include characteristic functions, modes of convergence and elements of stochastic processes.

Mathematics 607-608 Real Analysis I, II Continuous course; 3 lecture hours. 3-3 credits. Prerequisites: Mathematics 508. The real number system, Lebesgue measure, functions of bounded variation, differentiation and integration, the L spaces, introduction to Banach and Hilbert spaces, general measure theory, the Lebesgue-Stieltjes integral.

Mathematics 609 Topics in Topology Semester course; 3 lecture hours. 3 credits.* Prerequisites: Mathematics 509-510 and permission of the instructor. Special topics in topology selected from such subjects as advanced general topology, algebraic topology, topological algebra, and differential topology.

Mathematics 611-612 Complex Analysis I, II Continuous course; 3 lecture hours. 3-3 credits. Prerequisite: Mathematics 508. Elementary functions, analyticity, Cauchy's theorem and integral formula, Taylor and Laurent series, poles, and residues, analytic continuation, Riemann surfaces, periodic functions, conformal mapping, and applications.

Mathematics 613-614 Stochastic Processes Continuous course; 3 lecture hours. 3-3 credits. Prerequisites: Mathematics 503 and 508, or 514, or Biometry 545. Introduction to the theory and applications of stochastic processes. Random walks, Markov processes, queuing theory, renewal theory, birth-death and diffusion processes. Time series, spectral analysis, filters, autocorrelation. (Offered in conjunction with the Department of Biometry.)

Mathematics 617-618 Applied Mathematics I, II Continuous course; 3 lecture hours. 3-3 credits. Prerequisites: Mathematics 517 and 518. Partial differential equations; equations of Helmholtz, Laplace, and Poisson; the diffusion equation, integral transforms, and Green's function methods, calculus of variation, eigenvalues and eigenfunctions by variational methods, integral equations, Fredholm and Volterra equations, Fredholm and Hilbert-Schmidt theories.

Mathematics 619 Operational Methods Semester course; 3 lecture hours. 3 credits. Prerequisites: Mathematics 508. Transform methods applied to existence theory, explicit solutions to problems of mathematical physics, distributions of Schwartz and Gelfand-Silov; kernel theorems of Schwartz, mathematical framework of quantum field theory.

Mathematics 620 Theory of Partial Differential Equations Semester course; 3 lecture hours. 3 credits. Prerequisites: Mathematics 301 and 508. Classification of partial differential equations; elliptic, hyperbolic, and parabolic equations: potential theory, techniques of solving various partial differential equations; applications to electromagnetism and solid mechanics.

Mathematics 621 Boundary Value Problems Semester course; 3 lecture hours. 3 credits. Prerequisite: Mathematics 517-518. Survey of boundary value problems, approximate analytic solutions such as Galerkin's method and the Ritz method; application to heat transfer, fluid mechanics, and potential theory.

Mathematics 691-692 Research and Thesis Continuous course. 1-3 credits per course. Credits and hours to be arranged. Prerequisite: graduate standing. Independent research culminating in the writing of the required thesis as described.

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*May be taken twice for credit. Concurrent sections may be offered.

Statistics 513-514 Mathematical Statistics Continuous course; 3 lecture hours. 3-3 credits. Prerequisite: Mathematics 202. Probability, discrete and continuous distributions, moment generating functions, limit theorems, estimation, decision theory and testing hypotheses, relatonships in a set of random variables, linear models, and design.

Additional courses offered on the MCV Campus which supplement our graduate courses are listed below. The School of Basic Sciences and Graduate Studies section of the MCV Campus Bulletin should be consulted for other courses that are available to graduate students.

Biometry
- Stochastic Processes and Time Series
- Advanced Probability

DEPARTMENT OF PSYCHOLOGY

The Department of Psychology offers instruction in clinical psychology and in general psychology leading to the degrees of master of science and doctor of philosophy. The department also offers the degree of master of science in psychology with emphasis in counseling psychology.

The doctoral program in clinical psychology prepares the student for research and service in the clinical area. The doctoral program in general psychology prepares the student for either basic or applied research in physiological, learning, development, or social psychology. Both doctoral programs provide opportunities for selected students interested in college teaching to obtain special training and experience in that activity. All the masters' programs prepare students for additional graduate study. The masters' programs in clinical and counseling psychology also prepare students for work in applied areas.

The department maintains a number of research laboratories, an animal colony, a shop, and other research support facilities. The Psychological Services Center, operated by the department, is located on campus and serves as a clinical practicum facility.

An outstanding collection of current journals and books in psychology is housed in the James Branch Cabell Library on the Academic Campus and in the Tompkins-McCaw Library on the MCV Campus.

Research and teaching assistantships are available. The amount of the stipend is dependent upon the amount of service required.

All students are required to complete the core curriculum of 15 credits, including proseminars in physiological, learning, developmental, personality, and social psychology, as well as courses in applied statistics, experimental design, and professional problems. Receipt of a grade of "C" or lower in more than one of the courses of the core curriculum disqualifies a student from additional graduate study. Additional courses will be chosen in consultation with an advisor appropriate to the student's field of interest.

The candidate must complete all requirements for a degree within a seven-year period from the date of his admission to the program.

Students are required to pass a comprehensive examination at the master's level and a preliminary examination at the doctoral level.

Admission requirements include:

1. Graduation with a bachelor's degree from an accredited college or university, but not necessarily with a major in psychology.

2. Eighteen hours of undergraduate course work in psychology which must include each of the following courses: general psychology, applied statistics, and experimental psychology. Exceptionally well-qualified applicants without sufficient work in the field may be permitted to complete the undergraduate course requirements at the beginning of their graduate study program.

3. An undergraduate record indicating superior academic potential.

4. Satisfactory performance on the Miller Analogies Test and the Graduate Record Examination, including the special psychology examination.

5. Three letters of recommendation from previous instructors.

6. A personal interview may be required at the discretion of the department.

Application forms for admission to graduate study, application forms for assistantships, and brochures describing the special programs of interest as noted above are available on request from the department. Applications should be filed early to permit adequate review and to insure consideration.

The number of students who can be admitted is limited by the facilities and staff available. All students will be notified of the decision made.

Transfer credits for graduate work at other institutions will be evaluated after the completion of nine semester hours in the department.

The residence requirement for the master's degree is normally 18 hours in two semesters. Completion of the program usually requires three or four semesters.

The residence requirement for the doctoral degree is normally 36 hours in four semesters. Completion of the program usually requires three or four years.

With the consent of his program committee, a doctoral student may design a minor consisting of courses in departments other than psychology or courses in an area of psychology other than his major.

Practicum and internships will be required whenever these additional skills are consistent with the major emphasis of the student's program. Practicum credit will vary depending on the program. Internship will be without credit.

Before undertaking his dissertation a doctoral candidate must demonstrate either a reading knowledge in one foreign language or proficiency in computer programming.

All master of science degree candidates are required to complete a thesis and to defend it successfully in an oral examination. A dissertation requiring the planning, completion, and defense of an original research project is an integral part of the doctoral program.

COURSE DESCRIPTIONS*

Psychology 501 Physiological Psychology Semester course; 3 lecture hours. 3 credits. Data from the fields of anatomy and physiology are presented and their implications for psychology are discussed. Structure and function of the central nervous system, the internal environment, reflexes, emotional response, and the physiological viewpoint are studied.

Psychology 503 Introduction to Psycholinguistics Semester course, 3 lecture hours. 3 credits. Methodology and theory in studying human language behavior are introduced. Topics include the structure of communication using language, language acquisition, and the role of language in thinking and remembering. The relation of language to other ways of communicating is discussed.

Psychology 506 Perception Semester course; 3 lecture hours. 3 credits. Historical development of perceptual problems in psychology. A survey of early and contemporary major perceptual theories and related research with major emphasis on visual perception.

Psychology 507 Abnormal Psychology Semester course; 3 lecture hours. 3 credits. The development of personality is discussed with emphasis on factors leading to maladjustment. Lectures and readings cover the symptom groups of emotional disorders of both psychological and organic origin. Methods of assessing and treating these disorders are surveyed.

Psychology 508 Forensic Psychology Semester course; 3 lecture hours. 3 credits. An analysis of the motivation of criminal behavior as a social-psychological disorder; types of crime and the personality evaluation of juvenile delinquency and criminals; psychological analysis of lawbreakers, habitual offenders, criminals; psychological treatment in prison; psychology of sexual offenders, drug addicts, and alcoholics as lawbreakers.

Psychology 509 Personality Semester course; 3 lecture hours. 3 credits. The study of the various approaches to understanding human behavior in terms of personality theory. Various theories will be examined for commonality and uniqueness in assumptions, structure, dynamics, and development of personality.

Psychology 510 Principles of Learning Semester course; 3 lecture hours. 3 credits. The major theories of learning are reviewed in terms of their usefulness in the light of current research findings. The application to practical problems of laboratory results is discussed.

Psychology 511 Survey of Psychological Tests Semester course; 3 lecture hours. 3 credits. Prerequisite: Psychology 214. Concepts in psycho-

*Continuous courses may only be taken in the sequence listed; semester courses may be taken in any sequence; year courses do not carry partial credit for one semester's work without the other.

logical measurement and a survey of commonly used group tests; testing procedures and rationale underlying these tests; tests of intelligence, aptitude, achievement, interest, and personality critically examined, procedures described for selecting and evaluating specific group tests in these areas.

Psychology 513 Psychology of the Arts and Artists Semester course; 3 lecture hours. 3 credits. The meaning and function of the arts as a social and psychological phenomena. The personality of the artist and his sociocultural role. Psychological processes and experiences in producing the works of art. Emphasis on the graphic and plastic arts.

Psychology 515 Animal Behavior Semester course; 3 lecture hours. 3 credits. Review of methodology and data from ethology and comparative psychology. The course explores the effects of learning, motivation, social and developmental factors on the behavior of organisms ranging from one-celled animals to primates.

Psychology 524 Occupational Information and Career Development Semester course; 3 lecture hours. 3 credits. Survey of current research. Methods of obtaining occupational information and uses of that information in counseling.

Psychology 527 Psychology of the Handicapped Semester course; 3 lecture hours. 3 credits. A survey of the handicapped person, with particular emphasis on the mentally retarded, crippled, cerebral palsied, and hard-of-hearing; extent and nature of the handicap; psychological and emotional aspects; education, treatment, and rehabilitation.

Psychology 528 Mental Hygiene in the Classroom Semester course; 3 lecture hours. 3 credits. A behavioral analysis of common problems that occur in the elementary school classroom.

Psychology 531 Industrial Safety Semester course; 3 lecture hours. 3 credits. A comprehensive study of the principles and methods for the control and prevention of accidents adapted to the need of business and industry.

Psychology 540 Principles of Vocational Counseling Semester course; 3 lecture hours. 3 credits. The nature of the counseling interview. The relationship of aptitudes, abilities, interests, personality, and training to vocational behavior. The role of psychometrics in vocational counseling.

Psychology 541 Selection and Classification Semester course; 3 lecture hours. 3 credits. Study of principles of theory of psychological tests used in industry for selection and classification such as interviews and personal history.

Psychology 550 Psychology of the Mentally Retarded Semester course; 3 lecture hours. 3 credits. An analysis of the mentally retarded with special emphasis on the causes of retardation, psychological evaluation, diagnosis and classification as well as training, education, and counseling with retardates. Also included are the problems of institutionalization and the training of workers in the field.

Psychology 551 History and Systems of Psychology Semester course; 3 lecture hours. 3 credits. The history of psychological ideas and theories emphasizing the origin and interrelationships of major viewpoints and systems from ancient Greece to the present.

Psychology 601 Behavior Modifications Semester course; 3 lecture hours. 3 credits. Prerequisites: graduate standing in psychology and consent of instructor. Group and individual approaches in these general areas will be emphasized; observational techniques; counterconditioning and extinction procedures; techniques of positive and negative control; self-control procedures; use of modeling and role-playing as change techniques; behavioral feedback and cueing procedures.

Psychology 603 Developmental Processes Semester course; 3 lecture hours. 3 credits. Applications of scientific methods to the study of the child. Special attention is given to maturation and learning in early childhood and to cognitive, social, and emotional development from early childhood to adolescence. Consideration is also given to behavior theory and theories of personality as they apply to the infant and the child.

Psychology 604 Social Psychology of Business and Industry Semester course; 3 lecture hours. 3 credits. The theme is the influence of organizational structure on behavior. Topics will include motivation, attitudes, job satisfaction, morale, leadership, and supervision.

Psychology 605 Advanced Vocational and Educational Guidance Semester course; 3 lecture-seminar hours. 3 credits. Recent developments in theory, research, and practice related to counseling psychology.

Psychology 607 Advanced Educational Psychology Semester course; 3 lecture hours. 3 credits. Application of the principles of psychology to the teaching-learning process. Discussion will focus on the comprehensive development of individual learning experiences and educational programs from the point of view of the educator and the administrator.

Psychology 608 Individual Tests of Intelligence Semester course; 3 lecture hours. 3 credits. Prerequisites: graduate standing in psychology and consent of instructor. The administration, scoring, interpretation, and research foundations of the major individual tests of intelligence, with emphasis on the Wechsler scales and the Stanford-Binet.

Psychology 609 Design of Psychological Experiments Semester course; 2 lecture and 2 laboratory hours. 3 credits. The application of analysis of variance, randomization tests, analysis of ranks, and chi square to designs involving random groups, matched groups, repeated treatment, and repeated measurement, where the dependent variable is behavioral.

Psychology 613 Clinical Assessment I Semester course; 3 lecture hours. 3 credits. Prerequisites: graduate standing in clinical psychology and consent of instructor. Major objective personality and brain-damage assessment methods are intensively analyzed from the stndpoint of research foundations and clinical utility. Interview methods are presented. Emphasis is placed on the analysis of data from test and non-test sources, and on integrative report writing.

Psychology 614 Clinical Assesment II Semester course; 3 lecture hours. 3 credits. Prerequisites: graduate standing in clinical psychology and consent of instructor. The administration, scoring, and interpretation of projective personality tests, with emphasis on the Rorschach and TAT. Integration of projective test data as a basis for decisions in the psychological evaluation.

Psychology 616 Psychopathology Semester course; 3 lecture hours. 3 credits. Prerequisite: consent of instructor. Clinical and experimental contributions to the field of psychopathology, with particular attention to the roles of learning and motivation in the development of behavior disorders.

Psychology 618 Seminar in Personality Semester course; 3 lecture hours. 3 credits. Prerequisite: consent of instructor. A detailed exploration of various approaches in personality. Contemporary issues in personality theory.

Psychology 619 Seminar in Learning Semester course; 3 lecture-seminar hours. 3 credits. The major problem areas, methodology, and theories of learning are reviewed. Included are measurement techniques, drive and reinforcement, conditioning, memory, and other cognitive processes.

Psychology 620 Selected Topics Semester course; 3 lecture-seminar hours. 3 credits. Prerequisite: consent of instructor. Theory, research, and techniques in specialized topics of current interest are presented. May be repeated.

Psychology 621 Seminar in Motivation Semester course; 3 lecture hours. 3 credits. A survey of some theoretical views of motivation. Biological, cultural personality, and learning theories of motivation will be covered. Theoretical positions will be related to current empirical findings.

Psychology 623 Counseling and Psychotherapy Semester course; 3 lecture hours. 3 credits. Prerequisite: consent of instructor. Exploration of major trends in psychotherapeutic techniques and current research. Principles of therapy applied to personal, social, vocational, and educational problems.

Psychology 625 Pro-Seminar I Semester course; 3 lecture hours. 3 credits. A core course for the beginning graduate student covering current research and developments in physiological psychology and learning.

Psychology 626 Pro-Seminar II Semester course; 3 lecture hours. 3 credits. A core course for the beginning graduate student covering current research and developments in social psychology, developmental psychology, and personality.

Psychology 627 Statistics in Psychological Research Semester course; 2 lecture and 2 laboratory hours. 3 credits. Applications of descriptive and inferential statistics including significance testing and parameter estimation in empirical and experimental research on human and animal behavior.

Psychology 629 Biological Basis of Behavior Semester course; 2 lecture-seminar hours. 2 laboratory hours. 3 credits. Theory and current experimental research on the physiological and neurological concomitants of behavioral variables.

Psychology 630 Social Psychology Semester course; 3 lecture-seminar hours. 3 credits. Topics includes attitudes, social influence processes, person perception, affiliation and attraction, group processes, cultural influences on behavior, and conformity.

Psychology 635-636 Practicum I and II Continuous course; 3 credits. The graduate student is placed in an agency or institution for work experience appropriate to his field of specialization. Available to graduate students in counseling and industrial psychology who have been approved by their program committee. Not available to clinical students. All practicum work is performed under the supervision of an appropriate faculty member as well as qualified persons in the agencies or institutions.

Psychology 637 Seminar in Research Problems Semester course; 3 lecture hours. 3 credits. An intensive investigation of a specialized research area. Examples include delayed response problems in primates, systematic desensitization in the treatment of phobias, effects of drugs on avoidance learning. Emphasis on techniques and organization of past empirical findings and theoretical formulations. May be taken for repeated credit.

Psychology 639 Instrumentation and Circuit Design in Behavioral Science Semester course; 2 lecture and 2 laboratory hours. 3 credits. A basic course in the design and application of electrical and electronic circuits used in behavioral sciences. Both data collecting and environmental programming devices will be covered.

Psychology 640, 641, 642, 643, 644 Clinical Practicum Semester course; 1-3 credits; maximum of 12 credits allowed. The graduate student in clinical psychology is given an opportunity to apply and practice interview, diagnostic, and therapeutic skills with clients requiring psychological services. Careful supervision and evaluation of the student is provided. The practicum may be located in a clinic on campus or in a hospital or other agency off campus. Available only to graduate students in clinical psychology approved by the clinical program committee.

Psychology 671 Readings and Research Semester course; 1-3 credits. Individual study leading to the investigation of a particular problem in systematic fashion under the supervision of a member of the faculty. May be repeated for a maximum of nine credits. Written permission from supervisor must be presented at registration.

Psychology 675 Current Problems in Psychology Semester course; 1 lecture hour. 1 credit. A discussion of some of the current problems of interest to psychologists with particular emphasis on scientific publication, professional organizations, and ethics.

Psychology 677-678 Internship No credit. Prerequisite: approval of the director of clinical training. The internship is a one-year, full-time assignment, under supervision, to an agency approved by the student's program committee.

Psychology 701 M.S. Thesis 1-6 credits. May be repeated.

Psychology 703 Ph.D. Dissertation 1-12 credits. May be repeated.

DEPARTMENT OF SOCIOLOGY AND ANTHROPOLOGY

The Department of Sociology and Anthropology offers a program leading to the master of science degree with specializations in theory, methodology, criminology and deviant behavior, complex organization, industrial sociology, medical sociology, urban sociology, family, and social demography.

Students enrolled in the graduate program in sociology at VCU may select one of three graduate program degree options leading to an M.S. degree in sociology. The three options, described below, are differentiated by thesis, non-thesis, and pre-Ph.D. requirements.

All sociology courses are offered in the evening schedule.

OPTIONAL REQUIREMENTS

	Course Work	*Required Courses*	*Comprehensive Exam*	*Other Requirements*
Thesis Track	24 Hours +6 Hours thesis credit	601, 602, 608	Required	Thesis proposal defense, submission of acceptable thesis
Non-Thesis Track	36 Hours	601, 602, 608	Required	Acceptable public presentation of a research proposal
Pre-Ph.D. Track	30 Hours	601, 602, 608, 622	Required	Six hours of acceptable transferable graduate credit in approved courses taken while enrolled in any approved Ph.D. program.

Thesis Option:

The thesis option is primarily designed to serve students who plan to enroll in a doctoral program and wish to gain first-hand exposure to the research process. This option is also recommended for students who plan to enter fields where evaluation and conduct of research is essential. Students choosing this option will be required to publicly defend a proposal of their thesis. The function of the defense is to help the student identify problems in their research design and to improve the quality of their thesis through an interchange of ideas.

Non-Thesis Option:

The non-thesis option is primarily designed to serve students who do not anticipate going beyond the master's degree in terms of formal education. This option may be appropriate for students who plan to embark on a

teaching career in a community college, junior college, or secondary school. Individuals currently employed or planning careers in public or private agencies may also find this program suitable. Students electing this option are required to publicly defend a proposed research project before the department. The purpose of this defense is to insure that students have an adequate appreciation of the research process.

Pre-Ph.D. Option:

The pre-Ph.D. track is designed to accelerate the progress of students who are definitely committed to obtaining a doctorate in sociology or a related field. Students who elect this track must demonstrate a high level of achievement in required courses and comprehensive examinations and should attempt to gain as much exposure to on-going research as possible while enrolled at VCU.

Transfer Credit:

a. Six hours of sociology/anthropology transfer credit from other schools may be accepted toward our degree pending approval of the graduate program committee.

b. Six hours of graduate credit from other VCU departments may be acceptable towards our degree pending approval of the graduate program committee.

COURSE DESCRIPTIONS*

Sociology 548 Drug Dependence: Sociological and Pharmacological Aspects Semester course; 3 lecture hours. 3 credits. Prerequisites: Sociology 101 or Pharmacology 300 or permission of the instructor. This course will treat the behavioral pharmacological effects of drugs and the impact of drugs and drug users on societies from a sociological point of view. Interdisciplinary in nature, the course will involve primarily the Departments of Pharmacology and Sociology/Anthropology.

Sociology 600 Advanced Principles of Sociology Semester course; 3 lecture hours. 3 credits. A comprehensive analysis of the concepts and techniques useful for understanding society and culture as well as the social processes and structures operant within these spheres.

Sociology 601 Advanced Methods of Social Research Semester course; 3 lecture hours. 3 credits. Prerequisites: Sociology 214 and 320 or equivalent. Research as a systematic process involving formulation of the problem, design of the research, field operation, the processing and analysis of data, and preparation of the research report. Also considered are critical analyses of current methods, administration of research projects, and the significance of research to social action.

*Continuous courses may only be taken in the sequence listed; semester courses may be taken in any sequence; year courses do not carry partial credit for one semester's work without the other.

Sociology 602 Seminar in Sociological Theory Semester course; 3 lecture hours. 3 credits. A graduate level seminar emphasizing contemporary sociological theories.

Sociology 603 Seminar in Population Studies Semester course; 3 lecture hours. 3 credits. Analysis of fertility, mortality, and migration from a socio-demographic perspective. Special attention will be paid to sociological determinants of demographic processes and their interrelationships.

Sociology 604 Seminar in Industrial Sociology Semester course; 3 lecture hours. 3 credits. Significant trends in industrialization and its impact on society, especially in the United States.

Sociology 607 Seminar in Minority Group Relations Semester course; 3 lecture hours. 3 credits. Accommodation and assimilation of racial, religious, and ethnic minority groups in relation to the dominant culture.

Sociology 608 Advanced Statistical Methods Semester course; 3 lecture hours. 3 credits. Prerequisites: Sociology 214 and 320 or equivalent. A discussion of statistical methods related to sociological research. The statistical techniques include correlation and regression, multiple correlation, and multiple regression, T test, one- and two-way analysis of variance, nonparametric statistical techniques—especially PRE measures.

Sociology 609 Seminar in the Family Semester course; 3 lecture hours. 3 credits. Analysis of contemporary family life with an emphasis on the influence of social change. Consideration of current family crises and problems.

Sociology 610 Complex Organizations Semester course; 3 lecture hours. 3 credits. A study of complex organizations in society with emphasis on the determinants and effects of organizational structure and process.

Sociology 611 Studies in the Community Semester course; 3 lecture hours. 3 credits. The organization of the community with emphasis on major trends in urban development and growth. The interdependence of political, social, and economic geographic units. The need for cooperative planning and control.

Sociology 612 Seminar in the Sociology of Deviant Behavior Semester course; 3 lecture hours. 3 credits. The nature and functions of deviance. Theories and problems of social control.

Sociology 613 Social Stratification Semester course; 3 lecture hours. 3 credits. An indepth analysis of status differentials in society (e.g. social class, prestige, and power).

Sociology 614 Seminar in the Sociology of Education Semester course; 3 lecture hours. 3 credits. A sociological analysis of education as a social institution.

Sociology 615 Seminar in Mass Communications Semester course; 3 lecture hours. 3 credits. A sociological analysis of contemporary media and their interrelationships with social systems, media, and national development. Special emphasis on media as instruments of social and cultural change. (Some theoretical background in sociology is recommended.)

Sociology 616, 617 Independent Study and Readings Semester courses; 1-3 credits per semester. Prerequisites: consent of an instructor and the graduate program committee. A maximum of six credits may be submitted toward the master's degree.

Sociology 618 Seminar in Political Sociology Semester course; 3 lecture hours. 3 credits. The structure of power and processes in power maintenance and acquisition; social sources and consequences of political ideologies.

Sociology 622 Theory Construction Semester course; 3 lecture hours. 3 credits. A consideration of recent social theorists in which emphasis is placed on the logic of theory construction.

Sociology 630 Social Psychology Semester course; 3 lecture hours. 3 credits. Discussion and investigation of selected social psychological issues in sociology, as well as traditional and innovative methodology applied to these issues.

Sociology 645 The Sociology of Health and Illness Semester course; 3 lecture hours. 3 credits. An examination of socio-cultural factors in health and illness and the influence of social factors on recovery and rehabilitation. Special attention will be paid to the methodology found in current studies.

Sociology 698, 699 Topical Seminar Semester courses; 3 lecture hours. 3 credits. Seminars on current specialized areas of sociological and anthropological interest.

Sociology 701, 702 Thesis 1-3 credits per course. May be repeated.

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(Academic Year 1973-74)

Department of Biology

BLEM, CHARLES R. (1969) . . . . . *Assistant Professor of Biology*
B.S., Ohio University; M.S., Ph.D., University of Illinois.

BROWN, RUSSELL V. (1974) . . . . . *Professor of Biology and Chairman, Department of Biology*
B.A., M.A., University of Tulsa; Ph.D., Iowa State University.

CHINNICI, JOSEPH P. (1970) . . . . . *Assistant Professor of Biology*
B.A., La Salle College; Ph.D., University of Virginia.

DASHEK, WILLIAM VINCENT (1970) . . . . . *Assistant Professor of Biology*
B.S., M.S., Ph.D., Marquette University.

GOLDSTEIN, LEWIS C. (1955) . . . . . *Professor of Biology and Assistant Dean, School of Arts and Sciences*
B.S., M.S., University of Richmond; Ph.D., University of Virginia.

JEFFREY, JACKSON E. (1962) . . . . . *Associate Professor of Biology*
B.S., Virginia Commonwealth University; R.P.T. and Certificate in Physical Therapy, Medical College of Virginia of Virginia Commonwealth University; M.S., Virginia Polytechnic Institute and State University; Ph.D., Medical College of Virginia of Virginia Commonwealth University.

JOHNSON, MILES F. (1968) . . . . . *Associate Professor of Biology*
B.S., Wisconsin State University; M.S., University of Wisconsin; Ph.D., University of Minnesota.

KIMBROUGH, T. DANIEL, JR. (1967) ..... *Associate Professor of Biology*
B.S., M.A., University of Alabama; Ph.D., Auburn University.

LLEWELLYN, GERALD C. (1969) ..... *Assistant Professor of Biology Education*
B.S., Frostburg State College; M.S., Ph.D., Purdue University.

MILLS, RICHARD R. (1971) ..... *Professor of Biology*
B.S., Emory and Henry College; M.S., Ph.D., Virginia Polytechnic Institute and State University.

PAGELS, JOHN F. (1969) ..... *Assistant Professor of Biology*
B.S., Central Michigan University; M.S., Ph.D., Tulane University.

PARKER, RONALD D. (1969) ..... *Assistant Professor of Biology*
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REED, JAMES R., JR. (1968) ..... *Associate Professor of Biology*
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REYNOLDS, JOHN D. (1967) ..... *Associate Professor of Biology*
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SEIDENBURG, ARTHUR J. (1968) ..... *Assistant Professor of Biology and Pre-Health Sciences Counseling Coordinator*
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Department of Chemistry

ARRINGTON, DALE E. (1969) ..... *Assistant Professor of Chemistry*
B.S., University of Washington; Ph.D., University of Kansas.

BASS, ROBERT G. (1962) ..... *Professor of Chemistry*
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GRANT, GEORGE C. (1969) ..... *Assistant Professor of Chemistry*
B.A., Lehigh University; Ph.D., Rensselaer Polytechnic Institute.

KAPP, MARY E. (1940, 1946) ..... *Professor of Chemistry (Emerita)*
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LEFELHOCZ, JOHN F. (1967) ..... *Assistant Professor of Chemistry*
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OTTENBRITE, RAPHAEL M. (1967) ..... *Associate Professor of Chemistry*
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SHILLADY, DONALD D. (1970) ..... *Assistant Professor of Chemistry*
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Department of Mathematical Sciences

ALLAN, RICHARD E. (1972) ..... *Associate Professor of Mathematical Sciences*

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BROPHY, ALFRED A. (1959-1961) (1968) . . . . . *Associate Professor of Psychology*
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BUTLER, JOEL R. (1968) . . . . . *Professor of Psychology*
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*On leave, 1973-74, 1974-75.

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THOMAS, EDWIN R. (1950) . . . . . *Professor of Psychology*
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TIPTON, ROBERT M. (1965) . . . . . *Associate Professor of Psychology*
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Department of Sociology and Anthropology

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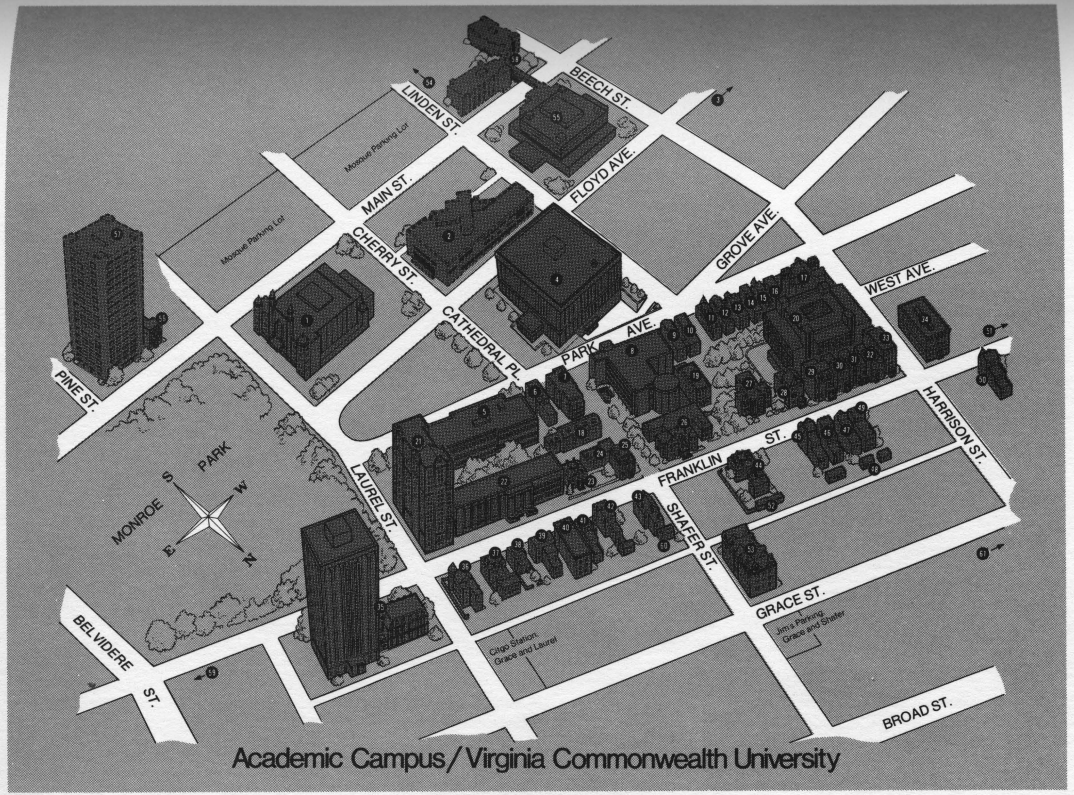
– NOTES –

– NOTES –



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2. Campus Center
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   Catholic School—Department of English
   Cathedral High School—Department of Education
4. Rhoads Hall, 614 Park Avenue
5. Dormitory, 928 Park Avenue
6. Hibbs Building and Cafeteria, 900 Park Avenue
7. Student Organization Building, 912 Park Avenue
8. School of Education, Department of English, 914 Park Avenue
9. Department of Psychology, 800 Park Avenue
10. Department of History, 808 Park Avenue
11. Dormitory, 928 Park Avenue
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14. Theatre Parking Deck, The School of the Arts, 325 North Harrison Street
15. Margaret L. Johnson Hall, 801 West Franklin Street
16. Gymnasium and Classrooms, 817-19 West Franklin Street
17. Ritter-Hickok Dormitory, 821 West Franklin Street
18. Department of Crafts
19. Founder's Hall (Dormitory), 827 West Franklin Street
20. Administration Building, 901 West Franklin Street
21. Dormitory, 909 West Franklin Street
22. Anderson House—Counseling Center, Student Services, Placement Office, 913 West Franklin Street
23. Special Services, Financial Aid, Housing, 915 West Franklin Street
24 & 25. Department of Music, 917-19 West Franklin Street
26 & 27. Scherer Hall, 923 West Franklin Street
28. School of Social Work, Departments of Occupational Therapy and History, 326 North Harrison Street
29. Rhoads Hall, 710-16 West Franklin Street
30. Department of Psychology, 800 West Franklin Street.
31. Dormitory, 806 West Franklin Street
32. Dormitory, 808 West Franklin Street
33. Department of Psychology, 810 West Franklin Street
34. Franklin Terrace—Departments of Urban Studies, Recreation, Rehabilitation Counseling, and Political Science, 812-14 West Franklin Street
35. Department of Administration of Justice and Public Safety, 816 West Franklin Street
36. Department of Sociology, 820 West Franklin Street
37. Department of Philosophy and Religious Studies, 826 West Franklin Street
    Offices of University Relations and Development, 828 West Franklin Street
38. VCU Administrative Offices, 910 West Franklin Street
39. Student Center, 916 West Franklin Street
40. VCU Police Department, 918 West Franklin Street
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42. Sculpture Studio
43. Department of Art History, 922 West Franklin Street
44. Meredith House, 1014 West Franklin Street
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48. Physical Plant Warehouse and Shops, 6 South Linden Street
49. School of Business, 1015 Floyd Avenue
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53. Center for Continuing Education, 301 West Franklin Street
54. Commonwealth Times (Behind 828 West Franklin)
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